# Maize stalk borers

*Busseola fusca; Chilo and Sesamia species*

Photo: CIMMYT, Flickr, CC BY-NC-SA 2.0, http://bit.ly/1amGK8S

*Maize stalk borer larvae and frass inside a young maize tassel.*

Photo: International Institute of Tropical Agriculture, Flickr, CC BY-NC 2.0, http://bit.ly/1FEC61c

*Larva feeding on maize stem.*

**SUMMARY**: Maize stalk borers are pests of maize, sorghum and other crops throughout many countries in Africa. The caterpillars bore into the stem of maize, feed on the internal tissues and cause the plant to wither and die. The pest can be controlled through a combination of cultural practices (most notably intercropping and the 'push-pull' system) and chemical insecticides or neem powder (but only at the early stage, before the larvae have bored into the stem).

## KEY SIGNS

Maize stalk borers are common pests throughout sub-Saharan Africa. There are three main species of stalk borers which attack maize: the African maize stalk borer (also attacks sorghum); the spotted stem borer (also attacks sorghum, bulrush millet, sugarcane and rice) and the African pink stem borer (also attacks finger millet, sugarcane and rice). The behaviour and development of all three is very similar. The larvae (caterpillars) first attack young plants, feeding on the leaves and entering the stem, damaging and reducing grain production or killing the plant.

The eggs of the African maize stalk borer are round, flat on top, creamy-yellow in colour and about 1 mm diameter. The larvae have no distinct features: they are creamy-white in colour often with a grey or sometimes pink colour and the head is dark brown. The larvae grow up to 40 mm long. Pupae are up to 25 mm long and shiny yellow-brown to dark brown in colour. The adult moths have a wing-span of about 25-33 mm. The forewings are light to dark brown with dark patterns and the hindwings are light to greyish-brown. Colouring varies somewhat depending on location and season.

The spotted stem borer larvae are creamy white to yellowish-brown with dark conspicuous spots and four purple stripes lengthwise across the back. The pupae are shiny, light yellow-brown to dark red-brown and 15 mm long. The adult moths are 7-17 mm long with a wingspan of 20-25 mm. The forewings are light yellow-brown with darker horizontal patterns, and the hind wings are white. The eggs are creamy-white, scale-like and are laid in overlapping batches on the underside of leaves near the midrib.

The African pink stem borer eggs are creamy-white when laid, but get darker as they develop. The larvae are smooth and shiny, creamy-white with a distinctive pink colouring, a brown head, and 30-40 mm long when mature. The pupae are yellowish-brown and 18 mm long. The adult moths are slightly smaller than the other two species of stem borers. They have yellowish-brown forewings, white hindwings, and a wingspan of 20-30 mm.

On young plants that have been attacked small holes or small dark larvae in the leaf funnel can be seen. An early sign is small holes in straight lines on young leaves. Larvae droppings (frass) are often visible on the leaves and in the stems. Larvae also attack the growing points, forming 'dead hearts' (meaning the central leaves become dry and withered). Older larvae feed inside the stems, weakening them and causing them to break. The top of the plant wilts, turns yellow, and eventually dries out and dies. If plants show symptoms, cut open the stem and look for larvae, pupae and frass.

## MANAGEMENT

**Prevention** – what to do before signs are seen

*Cultural approaches:* Resistant or tolerant varieties are available in some countries and should be used. Applying nitrogen, either as a mineral fertilizer, or as manure or compost, enhances the crops ability to sustain an attack.

To prevent the stalk borer, a 'push-pull' system can be implemented in which *Desmodium*, a repellent plant, and Napier grass, a trap crop, are intercropped with maize to push and pull the insect away from the maize. Plant Napier grass (the Bana variety is the best) along the border around the maize field and plant one row of *Desmodium* (silverleaf or greenleaf varieties) between every three rows of maize. The *Desmodium* should be planted first, as soon as the rains begin, so that it begins to repel the stalk borers before the maize emerges. At least three rows of Napier grass should be planted around the borders of the maize field. The *Desmodium* produces a smell that the adult moths do not like; this pushes the moths away from the maize. The stalk borers are more attracted to Napier grass than maize and so the border of Napier grass will pull the moths away from the maize to lay their eggs on the Napier grass. When the larvae bore into the Napier grass, however, the plant produces a sticky glue-like substance that traps them and they die. An additional benefit of this system is that *Desmodium* is a legume that fixes nitrogen into the soil; it also acts as a ground cover that supresses Striga, a parasitic weed. Disadvantages of this system include the space taken up by the Napier grass; the cost and lack of availability of *Desmodium* seed; and the difficulty in establishing the *Desmodium* crop.

Intercropping with non-host plants, such as cowpeas or cassava, will also reduce the damage. Adult moths will lay eggs on the non-host plants, but the larvae are unable to feed on them and will die.

Dispose of crop residues after harvest to reduce stalk borer populations and limit the pest the following season. The crop residues can be burned, used as feed for livestock, or left on the ground exposed to the sun's heat for one month to kill the larvae and pupae.

Rotate maize with a non-host plant, such as a legume (for example groundnut), to increase the nitrogen in the soil. This will make the next maize crop hardier and less susceptible to an attack and break the cycle of the stalk borer.

**Control** – what to do after signs are seen

*Chemical approaches:* Chemical control can be used early in the season by applying appropriate insecticides, such as trichlorfon, as granules or dusts to the leaf funnel of young plants. Neem powder can be effective and should be applied as a 1:1 mixture with dry clay or sawdust to the funnel of the plant: 1 kg of neem powder can treat 1500-2000 plants. Once the larvae have bored into the stem of the plant, insecticides are no longer effective.

## CAUSE

*Busseola fusca* is the scientific name of the African maize stalk borer. Common names include maize stalk borer, maize stem borer and sorghum stalk/stem borer. *Chilo partellus*, the spotted stem borer, is the most common of the *Chilo* species found in Africa, while the African pink stem borer, *Sesamia calamistis*, is the most common species of *Sesamia*. *Sesamia* are quite similar to B. fusca during the larval stage, but can be distinguished during the pupal and adult stages. *Busseola fusca* can also be confused with other African species of *Besseola, Poeonoma* and *Manga,* which have similar wing patterns but are rarely found on crops.

The adults lay batches of 30-100 eggs under the edges of leaf sheaths or in long columns up the stem. They prefer young plants or the youngest unfolded leaves. The larvae hatch a week later and move all over the plant, eventually entering into the leaf whorls (or funnel) to feed and tunnel into the stems. They feed inside the stems for 3-5 weeks. Before pupating they make an exit hole, through which the adult moth will eventually emerge, and then pupate in the tunnels they created in the stem for 9-14 days. When the adult moths emerge from the stem in the late afternoon or early evening, the females immediately release a pheromone to attract a male and mate, starting the cycle again. The adult moths are active at night, resting on plants and plant debris during the day. The total life cycle is 7-8 weeks long, but during dry or cold periods it can be up to 6 months (as they stop developing and remain in stems or plant debris).

## IMPACT

Yield losses up to 10-12% have been reported for maize. The African maize stalk borer is primarily a pest of maize and sorghum; other hosts include pearl millet, finger millet and sugarcane. Many wild grasses are also hosts, including Johnson grass (*Sorghum halepense*), elephant grass (*Pennisetum purpureum*), wild Sudan grass (*Sorghum verticilliflorum*) and Guinea grass (*Panicum maximum*).

## DISTRIBUTION

B. fusca is more common at high altitudes (above 1000m), and Chilo and Sesamia species at lower altitudes (below 1500m). The African maize stalk borer is native to sub-Saharan Africa and is present throughout the region from sea level to 2,000 meters altitude. The stalk borers are often spread through the transport of dry stems, grains and grasses that contain resting (diapausing) larvae.

## FURTHER READING

Plantwise Knowledge Bank www.plantwise.org/knowledgebank
BioNET-EAFRINET http://keys.lucidcentral.org/keys/v3/eafrinet/index.htm

*Material prepared by Erica Chernoh, November 2014*